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EXAMINER	
KIM, DAVID S	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/760,292	Applicant(s) SUGIHARA ET AL.	
	Examiner David S. Kim	Art Unit 2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 January 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 January 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *18 January 2001*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to because of the following informalities:

In Figs. 3-4, "sweeping control portion" is used where – switch control portion – may be intended.

Figs. 10-11 should each be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

2. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

3. **Claims 7-8, 15, 23, and 26-31** are objected to because of the following informalities:

In claims 7, 15, 23, and 31, l. 5-6, "a light receiver which receives the wavelength-multiplexed light signal" is used where something like – a light receiver which receives a wavelength from the wavelength-multiplexed light signal – may be intended.

In claim 8, l. 2, "claim 10" is used where – claim 7 – may be intended.

In claims 26-31, l. 2, "claim 24" is used where – claim 25 – may be intended.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The admitted prior art

5. **Claims 1-4, 7-12, and 15-16** are rejected under 35 U.S.C. 102(a) as being anticipated by the admitted prior art (hereinafter "APA").

Regarding claim 1, the APA discloses:

A wavelength multiplexing optical transmission system (Fig. 11) comprising:

A compensating unit (Fig. 11) which compensates polarization mode dispersion of wavelength-multiplexed and transmitted light signal for each predetermined channel block;

a wavelength selecting unit (wave divider 111) which selectively outputs light signal having a desired wavelength in the light signal;

a polarization analyzing unit (pmd detectors 114) which analyzes polarization mode dispersion based on light signal having a wavelength selected by said wavelength selecting unit; and

a compensation control unit (compensation control circuits 115) which controls polarization mode dispersion for each predetermined channel block by said compensating unit based on the result analysis in said polarization analyzing unit.

Regarding claim 2, the APA discloses:

A wavelength multiplexing optical transmission system according to claim 1 wherein said polarization analyzing unit analyzes polarization mode dispersion using Jones Matrix method (specification, p. 3-4, bridging paragraph).

Regarding claim 3, the APA discloses:

A wavelength multiplexing optical transmission system according to claim 1 wherein said polarization analyzing unit analyzes polarization mode dispersion using Poincare sphere method (specification, p. 3-4, bridging paragraph).

Regarding claim 4, the APA discloses:

A wavelength multiplexing optical transmission system according to claim l wherein said polarization analyzing unit analyzes polarization mode dispersion using SOP method (specification, p. 3-4, bridging paragraph).

Regarding claim 7, the APA discloses:

A wavelength multiplexing optical transmission system according to claim 1 further comprising:

a light transmitter (source of signal input to path 110 in Fig. 11) which transmits wavelength-multiplexed light signal;

a light receiver (light receivers 113) which receives the wavelength-multiplexed light signal; and

a light transmission path (path 110) connecting said light transmitter and said light receiver, wherein

at least one of said compensating unit or said plurality of compensating units are provided on said light transmission path or at a terminal end of said light transmission path (Fig. 11 is at the end of path 110).

Regarding claim 8, the APA discloses:

A wavelength multiplexing optical transmission system according to claim 7 wherein said wavelength selecting unit and said polarization analyzing unit are provided at a terminal end of or near said light transmission path (Fig. 11 is at the end of path 110).

Regarding claim 9, the APA discloses:

A wavelength multiplexing optical transmission system (Fig. 11) comprising:

a wave divider (wave divider 111) which branches wavelength-multiplexed and transmitted light signal for each predetermined channel block;

a plurality of compensating units (pmd compensation circuits 112) which compensate polarization mode dispersion for each light signal branched by said wave divider;

a plurality of wavelength selecting units (taps for light to pmd detectors 114) which selectively output light signal having a desired wavelength in light signal outputted from each compensating unit;

a plurality of polarization analyzing units (pmd detectors 114) which analyze polarization mode dispersion based on light signal having a wavelength selected by each wavelength selecting unit; and

a plurality of compensation control units (compensation control units 115) which control polarization mode dispersion by each compensating unit based on the result of analysis in each polarization analyzing unit.

Regarding claim 10, the APA discloses:

A wavelength multiplexing optical transmission system according to claim 9 wherein said polarization analyzing unit analyzes polarization mode dispersion using Jones Matrix method (specification, p. 3-4, bridging paragraph).

Regarding claim 11, the APA discloses:

A wavelength multiplexing optical transmission system according to claim 9 wherein said polarization analyzing unit analyzes polarization mode dispersion using Poincare sphere method (specification, p. 3-4, bridging paragraph).

Regarding claim 12, the APA discloses:

A wavelength multiplexing optical transmission system according to claim 9 wherein said polarization analyzing unit analyzes polarization mode dispersion using SOP method (specification, p. 3-4, bridging paragraph).

Regarding claim 15, the APA discloses:

A wavelength multiplexing optical transmission system according to claim 9 further comprising:

a light transmitter (source of signal input to path 110 in Fig. 11) which transmits wavelength-multiplexed light signal;

a light receiver (light receivers 113) which receives the wavelength-multiplexed light signal; and

a light transmission path (path 110) connecting said light transmitter and said light receiver, wherein

at least one of said compensating unit or said plurality of compensating units are provided on said light transmission path or at a terminal end of said light transmission path (Fig. 11 is at the end of path 110).

Regarding claim 16, the APA discloses:

A wavelength multiplexing optical transmission system according to claim 15 wherein said wavelength selecting unit and said polarization analyzing unit are provided at terminal end or near said light transmission path (Fig. 11 is at the end of path 110).

Kikuchi

6. **Claims 1, 7-9, and 15-16** are rejected under 35 U.S.C. 102(e) as being anticipated by Kikuchi (U.S. Patent No. 6,671,464 B1).

Regarding claim 1, Kikuchi discloses:

A wavelength multiplexing optical transmission system (Fig. 13) comprising:

a compensating unit (pmd compensators 165) which compensates polarization mode dispersion of wavelength-multiplexed and transmitted light signal for each predetermined channel block;

a wavelength selecting unit (i.e. wavelength separator 168 in 167-2) which selectively outputs light signal having a desired wavelength in the light signal;

a polarization analyzing unit (i.e. polarization measuring circuits 104 in Figs. 1 and 6) which analyzes polarization mode dispersion based on light signal having a wavelength selected by said wavelength selecting unit; and

a compensation control units (i.e. control circuits 105 in Figs. 1 and 6) which controls polarization mode dispersion for each predetermined channel block by said compensating unit based on the result of analysis in said polarization analyzing unit.

Regarding claim 7, Kikuchi discloses:

A wavelength multiplexing optical transmission system according to claim 1 further comprising:

a light transmitter (i.e. blocks 160-1, 161-2, and 167-1 in Fig. 13) which transmits wavelength-multiplexed light signal;

a light receiver (i.e. blocks 167-2, 160-3, and 160-4) which receives the wavelength-multiplexed light signal; and

a light transmission path (optical fiber transmission lines 162) connecting said light transmitter and said light receiver, wherein

at least one of said compensating unit or said plurality of compensating units are provided on said light transmission path or at a terminal end of said light transmission path (note placement of components at each end of Fig. 13).

Regarding claim 8, Kikuchi discloses:

A wavelength multiplexing optical transmission system according to claim 7 wherein said wavelength selecting unit and said polarization analyzing unit are provided at a terminal end of or near said light transmission path (note placement of components at each end of Fig. 13).

Regarding claim 9, Kikuchi discloses:

A wavelength multiplexing optical transmission system (Fig. 13) comprising:

a wave divider (wavelength separator 168 in 167-2) which branches wavelength-multiplexed and transmitted light signal for each predetermined channel block;

a plurality of compensating units (pmd compensators 165) which compensate polarization mode dispersion for each light signal branched by said wave divider;

a plurality of wavelength selecting units (i.e. optical couplers 103 in Figs. 1 and 6) which selectively output light signal having a desired wavelength in light signal outputted from each compensating unit;

a plurality of polarization analyzing units (i.e. polarization measuring circuits 104 in Figs. 1 and 6) which analyze polarization mode dispersion based on light signal having a wavelength selected by each wavelength selecting unit (i.e. optical couplers 103); and

a plurality of compensation control units (i.e. control circuits 105 in Figs. 1 and 6) which control polarization mode dispersion by each compensating unit based on the result of analysis in each polarization analyzing unit.

Regarding claim 15, Kikuchi discloses:

A wavelength multiplexing optical transmission system according to claim 9 further comprising:

a light transmitter (i.e. blocks 160-1, 161-2, and 167-1 in Fig. 13) which transmits wavelength-multiplexed light signal;

a light receiver (i.e. blocks 167-2, 160-3, and 160-4) which receives the wavelength-multiplexed light signal; and

a light transmission path (optical fiber transmission lines 162) connecting said light transmitter and said light receiver, wherein

at least one of said compensating unit or said plurality of compensating units are provided on said light transmission path or at a terminal end of said light transmission path (note placement of components at each end of Fig. 13).

Regarding claim 16, Kikuchi discloses:

A wavelength multiplexing optical transmission system according to claim 15 wherein said wavelength selecting unit and said polarization analyzing unit are provided at terminal end or near said light transmission path (note placement of components at each end of Fig. 13).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The admitted prior art as primary reference

9. **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over the APA as applied to claim 1 above, and further in view of Konishi et al. ("Dynamic gain-controlled erbium-doped fiber amplifier repeater for WDM network," hereinafter "Konishi").

Regarding claim 5, the APA does not expressly disclose:

A wavelength multiplexing optical transmission system according to claim 1 wherein said wavelength selecting unit comprising:

a wavelength variable filter which filters light signal having a desired wavelength from inputted light signals; and

a sweeping control unit which sweeps the wavelength to be filtered of the light signal.

However, such an arrangement of a wavelength variable filter and a sweeping control unit is known and common in the art; there are a myriad of applications that employ this arrangement. One such application is a WDM signal channel monitor, as shown in Konishi (p. 18, col. 1). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement such a monitor in the wavelength selecting unit of the APA. One of ordinary skill in the art would have been motivated to do this to provide diagnostic

information about the channel on the desired wavelength, such as channel number, wavelength band, and power (p. 18, col. 2, 1st paragraph).

10. **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over the APA as applied to claim 1 above, and further in view of Perrier et al. ("Optical crossconnect systems and technologies for the WDM transport network," hereinafter "Perrier").

Regarding claim 6, the APA does not expressly disclose:

A wavelength multiplexing optical transmission system according to claim 1 wherein said wavelength selecting unit comprising:

an optical switch which switches and outputs a desired light signal from inputted a plurality of light signals; and

switching control unit which controls switching of said optical switch.

However, such an arrangement of an optical switch and a switching control unit is known and common in the art; there are a myriad of applications that employ this arrangement. One such application is a WDM routing element that switches in and switches out desired light signals from an inputted plurality of light signals (the WDM signal), as shown in Perrier (p. 2-6). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement such a WDM routing element as part of the wavelength selecting unit of the APA. One of ordinary skill in the art would have been motivated to do this for any variety of common reasons for adding WDM routing to optical transmission systems, such as to increase the number of customers sites by enabling add/drop functions through the WDM elements (note that the WDM systems on p. 2 would be inaccessible from the location of the OADMs without the actual OADMs) or to increase connectivity, reconfigure connectivity on fixed physical topology, create alternate routes for enhance reliability, or to introduce service channels for monitoring/control (Perrier, p. 1-2).

11. **Claims 17-20 and 23-24** are rejected under 35 U.S.C. 103(a) as being unpatentable over the APA in view of Perrier.

Regarding claim 17, consider a wavelength multiplexing optical transmission system wherein a WDM routing element of Perrier (p. 2-6) precedes wave divider 111 of the APA. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement such a WDM routing element before the wave divider of the APA. One of ordinary skill in the art would have been motivated to do this for any variety of common reasons for adding WDM routing to optical transmission systems, such as to increase the number of customers sites by enabling add/drop functions through the WDM elements (note that the WDM systems on p. 2 would be inaccessible from the location of the OADMs without the actual OADMs) or to increase connectivity, reconfigure connectivity on fixed physical topology, create alternate routes for enhance reliability, or to introduce service channels for monitoring/control (Perrier, p. 1-2).

Together, the APA in view of Perrier discloses:

A wavelength multiplexing optical transmission system (Fig. 11) comprising:

a wave divider (Perrier, splitter on p. 6) which branches wavelength-multiplexed and transmitted light signal for each channel; and

a plurality of wave combiners (Perrier, combiners and MUX on p. 6) which combine light signal branched by said wave divider for each predetermined channel block.

a plurality of compensating units (APA, pmd compensation circuits 112) which compensate polarization mode dispersion for each light signal multiplexed by said wave combiner;

a plurality of wavelength selecting units (APA, taps for light to pmd detectors 114) which selectively output light signal having a desired wavelength in light signal outputted from each compensating unit;

a plurality of polarization analyzing units (APA, pmd detectors 114) which analyze polarization mode dispersion based on light signal having a wavelength selected by each wavelength selecting unit; and

a plurality of compensation control units (APA, compensation control units 115) which control polarization mode dispersion by each compensating unit based on the result of analysis in each polarization analyzing unit.

Regarding claim 18, the APA in view of Perrier discloses:

A wavelength multiplexing optical transmission system according to claim 17 wherein said polarization analyzing unit analyzes polarization mode dispersion using Jones Matrix method (specification, p. 3-4, bridging paragraph).

Regarding claim 19, the APA in view of Perrier discloses:

A wavelength multiplexing optical transmission system according to claim 17 wherein said polarization analyzing unit analyzes polarization mode dispersion using Poincare sphere method (specification, p. 3-4, bridging paragraph).

Regarding claim 20, the APA in view of Perrier discloses:

A wavelength multiplexing optical transmission system according to claim 17 wherein said polarization analyzing unit analyzes polarization mode dispersion using SOP method (specification, p. 3-4, bridging paragraph).

Regarding claim 23, the APA in view of Perrier discloses:

A wavelength multiplexing optical transmission system according to claim 17 further comprising:

a light transmitter (source of signal input to path 110 in Fig. 11) which transmits wavelength-multiplexed light signal;

a light receiver (light receivers 113) which receives the wavelength-multiplexed light signal;

a light transmission path (path 110) connecting said light transmitter and said light receiver, wherein

at least one of said compensating unit or said plurality of compensating units are provided on said light transmission path or terminal end of said light transmission path (Fig. 11 is at the end of path 110).

Regarding claim 24, the APA in view of Perrier discloses:

A wavelength multiplexing optical transmission system according to claim 23 wherein said wavelength selecting unit and said polarization analyzing unit are provided at a terminal end (Fig. 11 is at the end of path 110).

12. **Claims 25-28 and 31-32** are rejected under 35 U.S.C. 103(a) as being unpatentable over the APA in view of Jacob (U.S. Patent No. 6,266,457 B1).

Regarding claim 25, note the wavelength multiplexing optical transmission system of the APA (Fig. 11). It is implemented and associated with the end of a transmission path (path 110). Additionally, consider a similar system of Jacob (Fig. 4a) that is implemented and associated with the end of a transmission path. Jacob teaches that PMD is a limiting factor for WDM transmission systems (col. 7, l. 34-54), like the system of the APA. To compensate for such limiting factors, Jacob teaches the conventional use of regenerators prior to the end of the transmission path. Accordingly, at the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate regenerators prior to the system of the APA. One of ordinary skill in the art would have been motivated to do this to "clean up" WDM signals of the transmission (col. 7, l. 55-67), thus increasing the transmission/reception range of the system.

Jacob also teaches an alternate embodiment that is implemented and associated with the middle of a transmission path (Fig. 4b). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement the system of the APA in an

alternate embodiment, as generally shown in Jacob, at the location of the regenerators. One of ordinary skill in the art would have been motivated to do this to compensate for the negative effects of PMD along different points of the transmission path, reducing the number of times that a transmission signal has to be regenerated along the path (Jacob, col. 8, l. 59 – col. 9, l. 5), decreasing the overall cost to build, operate, and maintain the transmission system.

Together, the APA in view of Jacob teaches:

A wavelength multiplexing optical transmission system comprising:

a wave divider (Jacob, demultiplexer after CDCM 256 in Fig. 4b) which branches wavelength-multiplexed and transmitted light signal for each predetermined channel block;

a plurality of compensating units (PMD system of APA in the alternate in-line embodiment of Jacob; PMD compensation circuits 112 of the APA with the regenerators 212 of Jacob) which compensate polarization mode dispersion for each light signal branched by said wave divider;

a wave combiner (Jacob, multiplexer to the right of regenerators 212) which combines respective light signals outputted from each compensating unit;

a wavelength selecting unit (APA, taps to PMD detectors 114) which selectively outputs light signal having a desired wavelength in light signal outputted from said wave combiner (note that these taps output light signals that have desired wavelengths that are also in the light signal outputted from said wave combiner);

a polarization analyzing unit (APA, PMD detectors 114) which analyzes polarization mode dispersion based on light signal having wavelength selected by said wavelength selecting unit;

a plurality of compensation control units (APA, PMD compensation circuits 112) which control polarization mode dispersion by each compensating unit based on the result of analysis in said polarization analyzing unit.

Regarding claim 26, the APA in view of Jacob discloses:

A wavelength multiplexing optical transmission system according to claim 25 wherein said polarization analyzing analyzes polarization mode dispersion using Jones Matrix method (specification, p. 3-4, bridging paragraph).

Regarding claim 27, the APA in view of Jacob discloses:

A wavelength multiplexing optical transmission system according to claim 25 wherein said polarization analyzing unit analyzes polarization mode dispersion using Poincare sphere method (specification, p. 3-4, bridging paragraph).

Regarding claim 28, the APA in view of Jacob discloses:

A wavelength multiplexing optical transmission system according to claim 25 wherein said polarization analyzing unit analyzes polarization mode dispersion using SOP method (specification, p. 3-4, bridging paragraph).

Regarding claim 31, the APA in view of Jacob discloses:

A wavelength multiplexing optical transmission system according to claim 25 further comprising:

a light transmitter which transmits wavelength-multiplexed light signal (Jacob, source of signal input to demultiplexer after CDCM 256 in Fig. 4b);

a light receiver which receives the wavelength-multiplexed light signal (APA, light receivers 113); and

a light transmission path (APA, path 110 in Fig. 11; Jacob, input path to the demultiplexer after CDCM 256 in Fig. 4b) connecting said light transmitter and said light receiver, wherein

at least one of said compensating unit or said plurality of compensating units are provided on said light transmission path (Jacob, note complete transmission path in Fig. 3) or at

a terminal end of said light transmission path (APA, end of path 110 in Fig. 11; Jacob, in another reading, a transmission path ends before the demultiplexer after CDCM 256 in Fig. 4b).

Regarding claim 32, the APA in view of Jacob discloses:

A wavelength multiplexing optical transmission system according to claim 31 wherein said wavelength selecting unit and said polarization analyzing unit are provided at terminal end of or near said light transmission path (APA, end of path 110 in Fig. 11).

Kikuchi as primary reference

13. **Claims 2-4** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi as applied to claim 1 above, and further in view of the APA.

Regarding claims 2-4, Kikuchi does not expressly disclose:

A wavelength multiplexing optical transmission system according to claim 1 wherein said polarization analyzing unit analyzes polarization mode dispersion using

(claim 2) Jones Matrix method; or

(claim 3) Poincare sphere method; or

(claim 4) SOP method.

However, these polarization analyzing methods are all known in the art. The APA discusses them (APA, specification, p. 3-4, bridging paragraph). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to utilize one of these methods to analyze the PMD of Kikuchi. One of ordinary skill in the art would have been motivated to do this since each of them detects PMD with a sufficient accuracy and speed to be used in PMD compensation (APA, specification, p. 3-4, bridging paragraph).

14. **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi as applied to claim 1 above, and further in view of Konishi.

Regarding claim 5, Konishi is applied to address these limitations in the treatment of claim 5 under the APA. A similar argument is applied here to claim 5 under Kikuchi.

15. **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi as applied to claim 1 above, and further in view of Perrier et al.

Regarding claim 6, Konishi is applied to address these limitations in the treatment of claim 6 under the APA. A similar argument is applied here to claim 6 under Kikuchi.

16. **Claims 10-12** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi as applied to claim 9 above, and further in view of the APA.

Regarding claims 10-12, claims 10-12 introduce limitations that correspond to limitations introduced by claims 2-4. The APA is applied to address these limitations in claims 2-4 under Kikuchi. A similar argument is applied here to claims 10-12.

17. **Claim 13** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi as applied to claim 9 above, and further in view of Konishi.

Regarding claim 13, note that Kikuchi teaches that one can use one PMD compensator 165 for more than one WDM channel (Kikuchi, col. 12, l. 15-22). That is, the input signal to a PMD compensator 165 can be an optical signal comprising more than one WDM channel.

In view of this situation, Kikuchi does not expressly disclose:

A wavelength multiplexing optical transmission system according to claim 9 wherein said wavelength selecting unit comprising:

a wavelength variable filter which filters light signal having a desired wavelength from inputted light signals; and

a sweeping control unit which sweeps the wavelength to be filtered of the light signal.

However, such an arrangement of a wavelength variable filter and a sweeping control unit is known and common in the art; there are a myriad of applications that employ this

arrangement. One such application is a WDM signal channel monitor, as shown in Konishi (p. 18, col. 1). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement such a monitor in the wavelength selecting unit of the APA. One of ordinary skill in the art would have been motivated to do this to provide diagnostic information about the channel on the desired wavelength, such as channel number, wavelength band, and power (p. 18, col. 2, 1st paragraph).

18. **Claim 14** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi in view of Lam et al. ("A tunable wavelength demultiplexer using logarithmic filter chains," hereinafter "Lam").

Regarding claim 14, Kikuchi does not expressly disclose:

A wavelength multiplexing optical transmission system according to claim 9 wherein said wavelength selecting unit comprising:

an optical switch which switches and outputs a desired light signal from inputted a plurality of light signals; and

switching control unit which controls switching of said optical switch.

However, such an arrangement of an optical switch and switching control unit is known and common in the art; there are a myriad of applications that employ this arrangement. One such application is a WDM channel selector. Lam teaches such an exemplary WDM channel selector (p. 1660, Fig. 8).

Note that Kikuchi teaches that one can use one PMD compensator 165 for more than one WDM channel (Kikuchi, col. 12, l. 15-22). That is, the input signal to a PMD compensator 165 can be an optical signal comprising more than one WDM channel. In view of this situation, after passing through the PMD compensator 165, this WDM multi-channel optical signal would conventionally be further separated into the component WDM channels. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to

implement a WDM channel selector, such as shown in Lam, as the wavelength selecting unit of the APA. One of ordinary skill in the art would have been motivated to do this so that each of the component WDM channels is received by a receiver 166. Otherwise, a receiver 166 would receive more than one WDM channel simultaneously, resulting in an unintelligible signal due to the multiple WDM channels interfering with each other. Additionally, in the case that the system of Kikuchi communicates via optical packets, the WDM channel selector of Lam is recommended (Lam, p. 1661, col. 2, last paragraph).

19. **Claims 17 and 23-24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi in view of Perrier.

Regarding claim 17, consider a wavelength multiplexing optical transmission system wherein a WDM routing element of Perrier precedes block 167-2 of Kikuchi. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement such a WDM routing element before block 167-2 of Kikuchi. One of ordinary skill in the art would have been motivated to do this for any variety of common reasons for adding WDM routing to optical transmission systems, such as to increase the number of customers sites by enabling add/drop functions through the WDM elements (note that the WDM systems on p. 2 would be inaccessible from the location of the OADMs without the actual OADMs) or to increase connectivity, reconfigure connectivity on fixed physical topology, create alternate routes for enhance reliability, or to introduce service channels for monitoring/control (Perrier, p. 1-2).

Together, Kikuchi in view of Perrier discloses:

A wavelength multiplexing optical transmission system (Fig. 11) comprising:

a wave divider (Perrier, splitter on p. 6) which branches wavelength-multiplexed and transmitted light signal for each channel; and

a plurality of wave combiners (Perrier, combiners and MUX on p. 6) which combine light signal branched by said wave divider for each predetermined channel block.

a plurality of compensating units (Kikuchi, pmd compensators 165) which compensate polarization mode dispersion for each light signal multiplexed by said wave combiner;

a plurality of wavelength selecting units (i.e. optical couplers 103 in Figs. 1 and 6) which selectively output light signal having a desired wavelength in light signal outputted from each compensating unit.

a plurality of polarization analyzing units (Kikuchi, i.e. polarization measuring circuits 104 in Figs. 1 and 6) which analyze polarization mode dispersion based on light signal having a wavelength selected by each wavelength selecting unit (i.e. optical couplers 103); and

a plurality of compensation control units (Kikuchi, i.e. control circuits 105 in Figs. 1 and 6) which control polarization mode dispersion by each compensating unit based on the result of analysis in each polarization analyzing unit.

Regarding claim 23, Kikuchi in view of Perrier discloses:

A wavelength multiplexing optical transmission system according to claim 17 further comprising:

a light transmitter (i.e. blocks 160-1, 161-2, and 167-1 in Fig. 13) which transmits wavelength-multiplexed light signal;

a light receiver (i.e. blocks 167-2, 160-3, and 160-4) which receives the wavelength-multiplexed light signal; and

a light transmission path (optical fiber transmission lines 162) connecting said light transmitter and said light receiver, wherein

at least one of said compensating unit or said plurality of compensating units are provided on said light transmission path or at a terminal end of said light transmission path (note placement of components at each end of Fig. 13).

Regarding claim 24, Kikuchi in view of Perrier discloses:

A wavelength multiplexing optical transmission system according to claim 23 wherein said wavelength selecting unit and said polarization analyzing unit are provided at terminal end or near said light transmission path (note placement of components at each end of Fig. 13).

20. **Claims 18-20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi in view of Perrier as applied to claim 17 above, and further in view of the APA.

Regarding claims 18-20, claims 18-20 introduce limitations that correspond to limitations introduced by claims 2-4. The APA is applied to address these limitations in claims 2-4 under Kikuchi. A similar argument is applied here to claims 18-20.

21. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi in view of Perrier as applied to claim 17 above, and further in view of Konishi.

Regarding claim 21, claim 21 introduces limitations that correspond to limitations introduced by claim 13. Konishi is applied to address these limitations in claim 13 under Kikuchi. A similar argument is applied here to claim 21.

22. **Claim 22** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi in view of Perrier as applied to claim 17 above, and further in view of Lam.

Regarding claim 22, claim 22 introduces limitations that correspond to limitations introduced by claim 14. Lam is applied to address these limitations in claim 14 under Kikuchi. A similar argument is applied here to claim 22.

23. **Claims 25 and 31-32** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi in view of Jacob.

Regarding claim 25, note the wavelength multiplexing optical transmission system of Kikuchi (Fig. 13). PMD compensation is implemented and associated with the end of a transmission path (optical fiber transmission lines 162). Additionally, consider a similar system of Jacob (Fig. 4a) that is implemented and associated with the end of a transmission path.

Jacob teaches that PMD is a limiting factor for WDM transmission systems (col. 7, l. 34-54), like the system of Kikuchi. To compensate for such limiting factors, Jacob teaches the conventional use of regenerators prior to the end of the transmission path. Accordingly, at the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate regenerators prior to the system ends of Kikuchi. One of ordinary skill in the art would have been motivated to do this to "clean up" WDM signals of the transmission (col. 7, l. 55-67), thus increasing the transmission/reception range of the system.

Jacob also teaches an alternate embodiment that is implemented and associated with the middle of a transmission path (Fig. 4b). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement the system of Kikuchi in an alternate embodiment, as generally shown in Jacob, at the location of the regenerators. One of ordinary skill in the art would have been motivated to do this to compensate for the negative effects of PMD along different points of the transmission path, reducing the number of times that a transmission signal has to be regenerated along the path (Jacob, col. 8, l. 59 – col. 9, l. 5), decreasing the overall cost to build, operate, and maintain the transmission system.

Together, the Kikuchi in view of Jacob teaches:

A wavelength multiplexing optical transmission system (Kikuchi, Fig. 13) comprising:

a wave divider (Jacob, demultiplexer after CDCM 256 in Fig. 4b) which branches wavelength-multiplexed and transmitted light signal for each predetermined channel block;

a plurality of compensating units (PMD compensation of Kikuchi in the alternate in-line embodiment of Jacob; pmd compensators 165 of Kikuchi with the regenerators 212 of Jacob) which compensate polarization mode dispersion for each light signal branched by said wave divider;

a wave combiner (Jacob, multiplexer to the right of regenerators 212) which combines respective light signals outputted from each compensating unit;

a wavelength selecting unit (i.e. optical couplers 103 in Figs. 1 and 6) which selectively outputs light signal having a desired wavelength in light signal outputted from said wave combiner.

a polarization analyzing unit (Kikuchi, i.e. polarization measuring circuits 104 in Figs. 1 and 6) which analyzes polarization mode dispersion based on light signal having wavelength selected by said wavelength selecting unit (i.e. optical coupler 103);

a plurality of compensation control units (Kikuchi, i.e. control circuits 105 in Figs. 1 and 6) which control polarization mode dispersion by each compensating unit based on the result of analysis in said polarization analyzing unit.

Regarding claim 31, Kikuchi in view of Jacob discloses:

A wavelength multiplexing optical transmission system according to claim 25 further comprising:

a light transmitter (Jacob, source of signal input to demultiplexer after CDCM 256 in Fig. 4b; Kikuchi, i.e. blocks 160-1, 161-2, and 167-1 in Fig. 13) which transmits wavelength-multiplexed light signal;

a light receiver (Kikuchi, i.e. blocks 167-2, 160-3, and 160-4) which receives the wavelength-multiplexed light signal; and

a light transmission path (Kikuchi, optical fiber transmission lines 162; Jacob, input path to the demultiplexer after CDCM 256 in Fig. 4b) connecting said light transmitter and said light receiver, wherein

at least one of said compensating unit or said plurality of compensating units are provided on said light transmission path (Kikuchi, note complete transmission path 162 in Fig. 13; Jacob, note complete transmission path in Fig. 3) or at a terminal end of said light transmission path (Jacob, in another reading, a transmission path ends before the demultiplexer after CDCM 256 in Fig. 4b).

Regarding claim 32, Kikuchi in view of Jacob discloses:

A wavelength multiplexing optical transmission system according to claim 31 wherein said wavelength selecting unit and said polarization analyzing unit are provided at terminal end or near said light transmission path (Jacob, a transmission path ends before the demultiplexer after CDCM 256 in Fig. 4b).

24. **Claims 26-28** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi in view of Jacob as applied to claim 25 above, and further in view of the APA.

Regarding claims 26-28, claims 26-28 introduce limitations that correspond to limitations introduced by claims 2-4. The APA is applied to address these limitations in claims 2-4 under Kikuchi. A similar argument is applied here to claims 26-28.

25. **Claim 29** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi in view of Jacob as applied to claim 25 above, and further in view of Konishi.

Regarding claim 29, claim 29 introduces limitations that correspond to limitations introduced by claim 13. Konishi is applied to address these limitations in claim 13 under Kikuchi. A similar argument is applied here to claim 29.

26. **Claim 30** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi in view of Jacob as applied to claim 25 above, and further in view of Lam.

Regarding claim 30, claim 30 introduces limitations that correspond to limitations introduced by claim 14. Lam is applied to address these limitations in claim 14 under Kikuchi. A similar argument is applied here to claim 30.

Conclusion

27. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Epworth is cited to show related PMD compensation teachings for a WDM optical transmission system. Robinson et al. is cited to show in-line PMD compensation at different

points along an optical transmission path. Khosravani et al. is cited to show compensation for PMD teachings in multiple WDM channels of a WDM optical transmission system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Kim whose telephone number is 571-272-3033. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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